



Prevalence study on small ruminant brucellosis and associated factors in A.A Abattoir, Central Ethiopia

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Abstract

Across-sectional study was conducted from March till June 2022 to estimate sero-prevalence of small ruminants Brucellosis and to identify associated risk factors. A total of 460 animals were sampled randomly and aseptically from Addis Ababa abattoir central Ethiopia. 7.4 % and 3.26% of animals were found seropositive for *Brucella* using RBT and iELISA respectively. In this study the sero-prevalence of Brucellosis in goats (4%) is higher than in sheep (2%). The prevalence in adult animals in both species is higher than young and this may be due to the adult animals have more exposure of infection, and sexually maturity increase prevalence of diseases. Sero-prevalence of Brucellosis in goats is higher than sheep this may be because we use *Brucella abortus* antigen strain but to diagnosis *Brucella Ovis* in sheep soluble surface antigens obtained from the *B. ovis* REO 198 strain should be used. This finding could suggest the zoonotic significance of the disease and therefore identifying of animals using screening test before slaughter helps to handle positive-reactor carefully. Awareness creation and appropriate safety measures are very important.

Keywords: Brucellosis, risk factors, zoonosis, small ruminants and Abattoir

Introduction

Small ruminant are major source of livelihood to the masses of rural households. They are easy to manage and provide rapid cash turn over but productivity is inhibited by the multiple effects of factors such as diseases like brucellosis, Poor management and other causes (Tewodros & Dawit, 2015; Geletu *et al.*, 2021) ^[13, 5]. Brucellosis is a zoonotic disease caused by the genus *Brucella* capable of surviving and replicating within epithelial cells, placental, macrophages, and dendritic cells (Franc *et al.*, 2018; Tekle *et al.*, 2019) ^[4, 14]. Is common bacterial diseases affecting animals & humans and is difficult to prevent using treatment (Al-Anazi and Al Jasser, 2014). Brucellosis transmitted between animals through direct contact or contact with contaminated environment and is considered as a re-emerging zoonotic disease worldwide causing significant human morbidity in endemic areas (Donev *et al.*, 2010; Seleem *et al.*, 2010; Gupte & Kaur, 2015) ^[2, 11, 6]. Possibly due to rapid movement of livestock lack of control strategies and increased trade, prevalence of the disease appears to be increase. Therefore this study was amid to estimate prevalence of Brucellosis in small ruminant in the study area.

2. Materials and Methods

2.1. Description of the Study Areas and Animals

Addis Ababa, lies at an elevation of 2355 m (7,726 ft) above sea level at 9°2' 48"N latitude and 38°44'24"E longitude. The city lies at the foot of Mount Entoto and forms part of the watershed for the Awash. It has a typical highland climate with temperatures ranging from 110C to 240C. The area has a long rainy season occurring from June to September with an annual rainfall of 1184 millimeters (NMIE, 2016) ^[7]. Based on their dental eruption small ruminants between six months and one year were considered as young and above a year as adult study animals.

2.2. Study Design and Methods

A cross-sectional study was conducted from March to May 2022 to estimate sero-prevalence of small ruminants Brucellosis and to identify associated risk factors. Simple random sampling method was used to sample individual animals. Questionnaire such as knowledge on brucellosis and other zoonoses, was presented to respondents or concerned workers to assess associated risk factors.

2.3. Sample size determination and blood samples collation

While sample size determination, 50% expected prevalence was considered as there was no study conducted on small ruminant brucellosis in the study area. 95% confidence level and 5% desired absolute precision were the other determinants considered. Thus,

$$N = (Z)^2 * P(1-P)/D^2 \text{ .Thru-field (2007)}$$

Where: N = the required sample size

Z = the value of confidence interval (1.96)

P = expected prevalence rate (50%)

D = desired absolute precision (5%)

Hence, 384 heads of shoat were supposed to be sampled as per the above formula, however to reduce standard error and to obtain better accuracy a total of 460 animals (240 caprine) and (220 ovine) were sampled for this study purpose. Sera were harvested into Cryo-vials without mixing with clotted blood using a micropipette. Levelled, and then transported to the Animal Health Institute (AHI) in an ice pack stored at -20°C until processed.

2.4. Laboratory Analysis

2.1.1. Rose Bengal Plate Test (RBPT)

Antibodies against *Brucella* infection in the herd was screened using Rose Bengal Plate Test according to the OIE protocol (OIE, 2016)^[8]. In brief, Sera samples and *Brucella abortus* antigen strain 99 obtained from (ID.vet, RSA-RB-016, 0112 GB, 310, rue Louis Pasteur- Grable's- FRANCE) were mixed onto 12 wells glass slide white plate using an applicator stick and rocked for about 4 minutes then, visible agglutination as +, ++, +++ interpreted as positive and no agglutinations at 4 minutes was considered as negative results (OIE, 2016)^[8].

2.1.2. Indirect Enzyme-Linked Immuno Sorbent Assay (i-ELISA)

We use (ID. vet@, BRUS-MS-5P, C35, 1014 GB, 310, rue Louis Pasteur Garbles FRANCE) to confirm antibodies against *Brucella* infections. Briefly as per (OIE, 2016)^[8] protocol, sera sample and the two controls (positive and negative) were added into appropriate 96 well polystyrene micro plate pre-coated with purified smooth *Brucella* LPS. Anti-*Brucella* antibodies were exposed to the antigens for about 45 minutes at room temperature. After removing the unbound materials multi species horseradish peroxidase (HRP) conjugate was added to the micro wells. Substrate solution (TMB) was added and finally examined for the intensity of reaction with an automated ELISA reader at 450 nm. The resulting blue coloration depends on the number of specific antibodies present in the specimen which became yellow after the addition of the stop solution.

2.5. Data management and analysis

Data was stored analyzed in the Microsoft excel spread sheet

program using STATA 13.0 version software program. The sero-prevalence of the disease was calculated by dividing the number of iELISA positive animals by the total number of animals tested.

2.6. Consent to participate

This study did not involve human participants it involved only animal samples. Informed consent was obtained from concerned animal health staff to take samples from animals. Confidentiality of data obtained and the scientific morality was considered.

3. Results and Discussion

The confirmed overall sero-prevalence of brucellosis using iELISA in the study area was 3.26%. In the sense of sensitivity and specificity, i-ELISA was a better as compared to RBPT and CFT to diagnosis brucellosis in sheep and goats (Sadhu DB *et al.*, 2015). Prevalence of brucellosis by species of animals is indicated in Table 1.

Table 1: Sero-prevalence of small ruminant brucellosis by species of animals

Animal species	No of sample tested	RPT Positive	iELISA Positive
Caprine	240	22(9.17%)	10(4.17%)
Ovine	220	12(5.45%)	5(2.27%)
Total	460	34(7.39%)	15(3.26%)

3.1. Association of risk factors with sero-prevalence of brucellosis in shoot

Sero-prevalence of brucellosis in goats (4.17%) is greater than sheep (2.27%) while using both RBT and iELISA this may be because the smooth SLP *Brucella abortus* antigen do not detect *Brucella Ovis*. For diagnosis rough strain Brucellosis like *Brucella Ovis* in sheep, soluble surface antigens obtained from the *B. ovis* REO 198 strain should be used (Nielsen *et al.*, 2004; Praud *et al.*, 2012). Prevalence of the disease in adult (4.36%) is higher than in young (1.6%). Regarding sex, prevalence of brucellosis is higher in male in goats than in female but in sheep females has slightly higher proportion of infection (table 2). Respondents have better safety protocol and understanding on zoonosis but somewhat little concept on brucellosis.

Table 2: Sero-prevalence of small ruminant brucellosis according to species sex and age

Risk factor	No of Sampled Animals	RBT positive	iELISA Positive
Caprine	240	22(9.17%)	10(4.17%)
Male	160	17(10.62%)	8(5%)
Female	80	7(8.75%)	2(2.5%)
Ovine	220	10(4.5%)	5(2.27%)
Male	150	7(4.67%)	3(2%)
Female	70	3(4.3%)	2(2.9%)
Total	460	34(7.39%)	15(3.26%)
Age			
Young	185	6(3.24%)	3(1.6%)
Adult	275	28(10.18%)	12(4.36%)

4. Conclusions and recommendation.

Shoot Brucellosis has zoonotic importance transmitted mainly by direct contact with biological materials and contaminated environment. Therefore further studies on prevalence Isolation of the agent and on public health

significance of the disease are recommended. Knowledge and attitude of the community should be updated.

5. Acknowledgments

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6. Availability of data and materials

Due to the confidentiality agreements made, the datasets generated and/or analyzed during the study are not publicly available.

7. Consent for publication

Not applicable

8. References

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